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### Mycological Notes.—III.

By BYRON D. HALSTED.

*Relation of Bacteriosis to outward Conditions.*—Some notes that may be of interest to mycologists were made upon a plot of bush beans during the past season. The rows ran nearly north and south and upon the east side of the plants there was but a

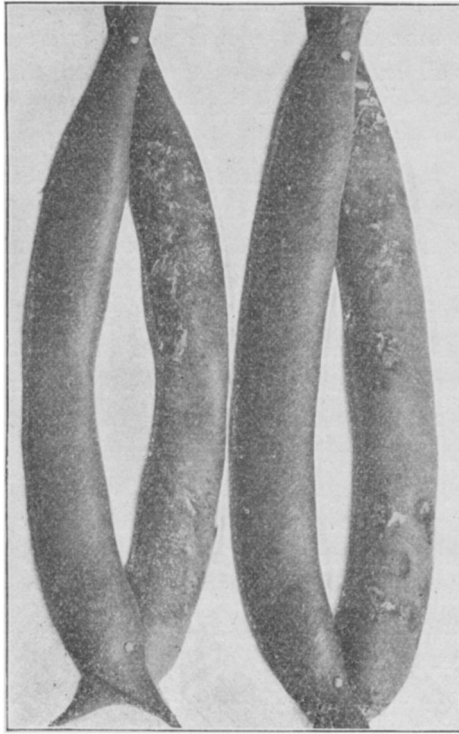


FIG. I.

small amount of the bacteriosis, due to *Bacillus phaseoli* Sm., to be seen while upon the west side nearly every pod of the "green flageolet" variety was more or less blotched, many of them literally covered with the bacterial ulcers. The engraving, figure 1,

shows two sample pods split to expose both sides, the upper in each case being healthy and grown with an eastern exposure, while the western halves of the same pods are shown below their respective mates, and were badly diseased. The ulcers were in many instances of an amber color, due to the multitude of the germs of the bacillus that had collected in a layer upon the surface.

Fully nine-tenths of all the blotches were upon the western sides of the pods and about two-fifths of all the pods of the variety in question were badly affected.

Strong winds upon the 17th and 20th of September bent the plants to the southeast, from which they did not fully recover. As a result, at the time the above observations were made, October 5th, the plants all leaned several degrees from the perpendicular and some of the pods were likewise tilted. In short, the foliage of the plants hung chiefly upon the eastern side of the row and had done so for between two and three weeks, and therefore one side of each pod was more exposed than the other, and that exposure was, speaking generally, in the direction of the four o'clock sun.

It had been previously observed that the leaves of the plants under consideration were badly blighted for weeks before the pods became noticeably injured, and it is not unlikely that the germs were carried from the diseased leaves to the pods by the dripping dews, in which case the side that was slightly inclined upward on account of the slanting posture of the plants would receive a more generous supply of the germs than the more protected underside.

It is possible that the bending of the plants so exposed the pods that they became more or less injured by the sun and thus provided more favorable conditions for the development of the bacteria. The warmth of the sunny side may have been sufficient to make the difference observed.

All the circumstances may have combined to bring about the results that were so strikingly evident. The bending of the plants and the swinging of the foliage to the eastward, the inclining of the pods and the exposing of the upper surface, that would naturally receive the drips from the diseased leaves, the autumn sun during the afternoon, either adding the required warmth for the germs or partially scalding the side most exposed and thus render the tissues more susceptible to attack are all still open questions.

One cannot but wonder what the result might have been had the plants been pressed back into place after the storm or a portion of the plot been shaded or even if the rows had run east and west instead of north and south.

*The Hollyhock Rust.*—Mr. J. A. Kelsey, Assistant at the plant hospital, brought me upon March 23d some badly rusted hollyhock leaves from the ornamental grounds of a person living in the suburbs of New Brunswick. The teleutosporic sori of this rust (*Puccinia malvacearum* Mont.) are very prominent and stand up almost like beads from the surface of the leaf. They are more abundant upon the under than the upper side of the leaf, but may arise anywhere even upon the long petioles.

Upon the leaves examined the sori were in all stages of formation, from the mere yellow orange discoloration of the affected tissue to the fully developed, nearly spherical masses of teleutospores. These latter are at first of a light brown color, but the point of most interest in this connection was the gray appearance possessed by many of the sori, particularly upon the upper side.

The first thought upon noticing this wide difference in color, namely that the spores were undergoing germination proved correct, for upon making a microscopic examination the upper cell of each teleutospore in a majority of cases had sent out its promycelium and developed the sporidia. It was the luxuriant growth of these hyphae and spores that had given the peculiar appearance to the sori that under a hand lens looked as if attacked by some delicate mould.

It would seem that this species of *Puccinia* produces teleutospores in very early spring, and that these germinate at once and by the time the hollyhock is ready to form new leaves there is a large crop of sporidia ready to infect them.

No signs of any aecidium form is met with in connection with the Hollyhock rust, and the uredo is apparently absent, making this species one of the *Leptopuccinia* group. The fungus winters as hibernating hyphae in the tissue of the rosette of leaves and start into full vigor at the first suggestion of spring.

During this season the hollyhock rust has been used for class demonstrations of promycelium and sporidia instead of the *Gymnosporangium macropus*, which it precedes by several weeks, and

is altogether more satisfactory because it can be easily cultivated for weeks in the laboratory.

*Witches Broom upon Asparagus.*—The “witches broom” of the cedar caused by species of *Gymnosporangium* and of the



FIG. 2.

cherry by *Exoascus cerasi* (Fl.) have received their full share of attention in works upon fungi; but the writer fails to note any mention of a similar growth upon asparagus.

During the past year while visiting various fields in a study of the rust (*Puccinia asparagi* DC.) it has been observed that in many instances asparagus plants otherwise entirely free from the rust would have one or more diseased tufts and these assumed an appearance that at once suggested the "witches brooms" of cedar and cherry trees, although upon a much smaller scale.

There seems to be no order as to their appearance, as sometimes they are near the tip of the main branch and again they are here and there along the stem as malformed lateral shoots. The engraving (figure 2) shows a small branch upon which there are two rusted twigs. The one at *a* is the lowermost branch of a side shoot, all other portions of which are normal. At *b* is shown a second rusted and dwarfed branch, while next above it is a normal twig. The differences between the infested and healthy branches are well shown in the engraving made from a sun print of the subject and one-third reduced. In the diseased parts the "leaves" while more numerous are not about half the ordinary size and there is a strong tendency to produce side branches and thus form the "broom." Sometimes the diseased branch develops so that there is a decided tuft, which tends to grow upright even if the main branch bearing it is more or less inclined. This tendency for a fungous infested branch to be perpendicular is as well illustrated in these "brooms" as in case of the prostrate euphorbias attacked by *Aecidium* or the common purslane when badly infested with white mould (*Cystopus portulacae*).

In case the asparagus plant is inoculated as its young succulent stems come above ground there is but little chance of "brooms" to form and they therefore are generally met with in beds where the spores have not reached the plants until they are approaching full growth. The local disturbance indicates a local inoculation and the malformation shows how rapidly the fungus spreads in the host.

*The Rose Speck.*—Recently it was my privilege to visit a brand new greenhouse in which a middle bed of roses had recently been set out. The leaves of these plants were nearly all dotted over with minute circular black specks smaller than the head of a bank pin and jet black. The gardener was exercised over the sudden appearance of these numerous specks and desired a preventive.

The specks upon examination were found to be filled with spores, and, therefore, the dark somewhat oval circular dots were of fungous origin. It was also observed that the clean white wood-work of the greenhouse was also spotted in the same manner as the plants.

The fungus in question is *Pilobolus crystallinus* Tode., which is one of the Mucorini that had grown upon the horse manure used liberally in the bed and covered the surface of the soil under the rose bushes. This fungus produces its spores in black sporangia that are at maturity thrown to a considerable distance by the enlarged portion below the sporangium filled with liquid suddenly collapsing as the spore case leaves the tip of the filament. In this manner in the greenhouse in question the sporangia have been thrown upward to the roof, ten feet above the bed of manure, and the glass was spotted with the adhering spore specks.

Along one side of the rose bed is a glass partition wall and upon this was a record of the distance to which a majority of the sporangia may be thrown. Between two and three feet seemed to be the average distance or range of the mycological mortars in this microscopic bombardment.

It is scarcely necessary to state that the gardener's mind was put at ease when he determined the cause of the disfigurement of his rose and other neighboring plants.

*Rust of the Safflower.* During August, 1895, while spending a few days at Cottage City, Massachusetts, the writer's attention was attracted to a row of safflower (*Carthamus tinctorius*) growing in the quaint kitchen garden of a humble family of foreigners, probably Russians. The safflower plants, sometimes called false saffron, were probably grown both for their curious spinose orange heads of flowers and the dye that is contained therein. But it was the exceedingly distressing condition of the plants as a whole that made me look a second time over the extemporized garden fence of lath and various sticks. This led to a call at the house for the privilege of a closer inspection, which I trust was granted; however, no intelligible words passed between the owner and the visitor to verify the fact.

In short, the plants were found to be badly infested with a fungus that, upon microscopic examination turns out to be

*Puccinia carthami* Corda. Notice is here made of this find, for it appears to be the first time that this rust has been taken in the United States. The host plant is so rarely grown that it is not likely to be frequently met with. It is curious that in this foreign garden a rust should have developed so extensively as to show itself upon nearly every leaf, and doubtless had nearly ruined the crop. Possibly it came in from the native country in the seed of the *Carthamus*, or it may be some of the herb-leaf, branch and flower as a coloring material accompanied the immigrants. Saccardo records it for Silesia and Bohemia.